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論　文　内　容　の　要　旨
Abstract of Dissertation

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Currently, composite membrane adsorbents have emerged as a new class of membrane materials for wide applications of purification and separation processes such as gas separation, pervaporation and adsorption, etc. Among various polymer materials used as a matrix, nylon has excellent characters used for membrane materials having amide groups used as reactive functional groups on the membrane backbones. However, due to difficulty in the solubility of nylon in solvents, there have been no reports in using the nylon monolith membrane for adsorbents. Therefore, this study focused on the combination of zeolite with nylon 6 in polymer−based composites for the separation of Pb^{2+} from mixture solution with Cu^{2+} and Cd^{2+} and adsorption of ethylene gas released from bananas.

Nylon 6−mordenite zeolite composite membranes were fabricated by wet phase inversion method using methanol/$CaCl_2$/nylon 6 solution. The resultant membranes containing mordenite zeolite powders with 10, 20 and 30 wt% loading were obtained as coagulated in water. Depending on the mordenite loading in the composite membranes, the porous morphology was changed in a fnger−like and/or sponge structure. In the separation tests of heavy metal to the composite membranes, the adsorption process obeyed in Langmuir plots, also the composite membranes having higher loading of mordenite had a higher value of the adsorption capacity for metal ions due to the higher surface area. Furthemore, the batch separation factor calculated using Langmuir isotherm parameters supported the selective adsorption of Pb^{2+} relative to those of Cd^{2+} and Cu^{2+}. The separation mechanism of the heavy metal ions on the nylon 6−mordenite zeolite

composite membranes was occurred by the chelation process of the amide groups of nylon 6 and the electrostatic force of the mordenite sites embedded on the nylon 6 matrix. For the ethylene adsorption, ethylene gas adsorption behavior was better fitted to the Freundlich model. This meant that ethylene molecules were adsorbed by multilayer and heterogeneous adsorption onto the adsorbent in the sites of mordenite. The experiment results showed that as the mordenite loading increased in the membrane, higher adsorptibility for ethylene was observed. The composite membranes were also examined for ethylene removal in the presence of Chiquita bananas at different mordenite loadings, different adsorbent masses, and different storage temperatures. The results showed that the composite membranes adsorbed significantly the endogenous ethylene emanated from bananas, hence prolonging the storage life of fruits

In conclusion, the present study successfully fabricated the porous nylon 6−mordenite composite membranes which can use as low−cost and environmentally friendly adsorbents.